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EDITORS' OUTLOOK

One has only to read the minutes of the Ithaca Meeting and the by-laws of the Division found in THIS JOURNAL to realize that the teaching of chemistry is headed toward a real profession. When one reviews what the chemistry teachers have accomplished in one short year, there cannot help being a certain amount of inspiration. It is just one year since the Journal of Chemical Education was suggested. When THIS JOURNAL comes from the press it will have completed its eighth issue and during this time the growth has been so marked that the Division has been compelled to elect a Treasurer-Business Manager in addition to the usual officers. The Division is to be congratulated upon obtaining for this new office E. M. Billings of Rochester, N. Y., who has already done so many good things for the Society. Greater things are anticipated.

During this same period of journal growth the work on the correlation of high school and college chemistry has reached a most encouraging position. The Committee of Chemical Education is now anticipating a national conference on it, where there will be representatives from State Departments of Education. There have been sufficient requests from different states to justify this important move. There seems to be no question on the part of the states making such requests but all states can come to an agreement on certain fundamental principles if not much of the detail. The time and place of this meeting will be announced later. This means if you have any criticisms on this outline send them in at once. A copy of this correlation plan was inclosed in the September issue.

Another project which is growing and which promises to do much toward making chemistry teachers much stronger professionally is their movement toward a national organization. It will be noted that the Division

has taken steps to have this organization take place in one of two ways, *i. e.*, either around the Local Sections of the A. C. S. or by the formation of independent State Associations of Chemistry Teachers. The next issue of THIS JOURNAL will present suggestions to cover both types of organization. The exact type of organization must be left to the judgment of the teachers in each State or Section. Take up the matter with your Contributing Editor or the Chairman of your Local Section.

Some of the usual functions of these organizations were given in the September issue of THIS JOURNAL, but those were only a few of the opportunities which such associations will afford. The value of a live organization of chemistry teachers, both from the standpoint of the teacher and of the science, can hardly be over estimated. It is a business proposition for every chemistry teacher to get back of these movements. We cannot expect to receive promotions in our profession until we make ourselves worthy of such promotions. Let us all go forward together. There is strength in unity.

N. E. G.

The following papers have been accepted and will be published as soon as space permits:

The High School Chemistry Course Versus the College Requirement.
CHARLES H. STONE

A Plea for Rationally Coördinated Courses in Analytical Chemistry.
PAUL H. M. P. BRINTON

The Chemistry Hobby.
R. W. EDMISTON

A New Covering for Laboratory Table Tops.
B. S. HOPKINS

Overlapping of High School and College Chemistry.
S. R. POWERS

Chemistry in the French Lycees.
WILLIAM FOSTER

Movies in the Service of Science.
E. G. KRAEMER

A NEW FORM OF PERIODIC TABLE AS A PRACTICAL MEANS OF CORRELATING THE FACTS OF CHEMISTRY

GEO. W. SEARS, UNIVERSITY OF NEVADA, RENO, NEVADA

Ever since Mendeleeff first expressed the Periodic Law in 1860 and gave it a practical meaning in his Periodic Table, chemists have been seeking to discover the underlying principles for such a law and to give a more accurate illustration of the relation existing between the elements. Many attempts have been made to arrange the elements in a table that would more nearly express the law in the light of the ever increasing knowledge of atomic structure, and that would make less apparent the seeming inconsistencies of the Mendeleeff table.

Probably the most important and widely known of the modern tables are those proposed by Werner and by Harkins. By arranging the elements in periods whose length increases in a definite ratio, Werner succeeded in giving a fairly logical position to hydrogen, the rare earth group and the triads of group eight and in placing elements of similar properties in neighboring positions. There is little, however, in his arrangement to suggest valence relation or to make use of the electron theory as applied to valence. In this respect the table of Harkins is probably the most satisfactory. His use of the double spiral in space gives groups zero and eight their most logical position as transition elements and at the same time points out the distinction between the subdivisions of each group.

In spite of the excellent work that has been done by investigators in this field and its undoubted value in the correlation of the great mass of facts in chemistry, comparatively little use is made of these periodic tables in our undergraduate courses. Too few of our seniors are able to make use of them as a basis for reasoning. While in many cases this is probably due to the lack of a realization of their value by the student, the major part is undoubtedly due to the tables themselves. A careful study of the development of the periodic table shows that it has become more complex and more difficult for the untrained mind to grasp. As a result our textbook writers have held pretty consistently to slightly modified forms of Mendeleeff's original table. These usually do not bring out the existing relations as clearly as the more modern tables. The development of the periodic table, therefore, has tended rather to clarify chemistry in the minds of chemists than to simplify its study for the student.

In order that a table may be of practical value to the student, unfamiliar with the elements and their relations to each other, it must not only be simple and compact but must express in graphic form the facts of chemistry. We are all aware that the student who repeatedly reads through an assigned number of pages with the hope of remembering enough of the facts to make a passing grade not only wastes much valuable time but fails to

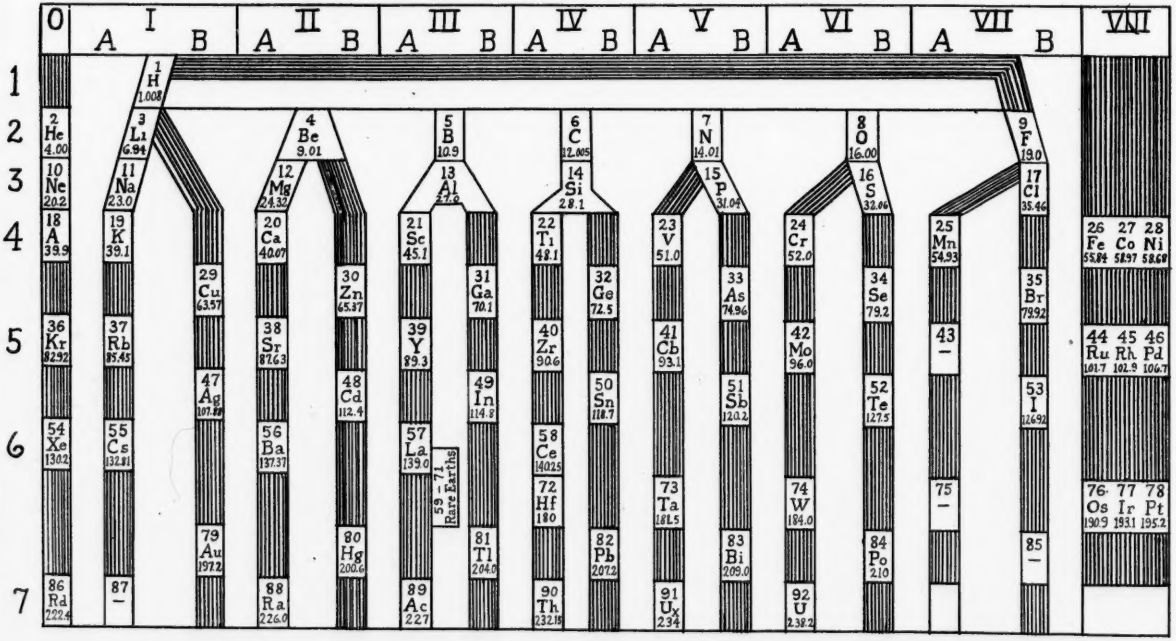
develop the power to solve the problems that are sure to confront him later in life. He has merely memorized facts with little or no idea of correlating them so that conclusions may be drawn. By using a periodic table to correlate the facts and by making a critical study of the table the student not only has an incentive for looking up the facts but sees their relation to each other and finds it easier to remember them because he has a hitching post, as it were, a something about which he may group them in a systematic manner.

As a basis for the correlation of the facts of chemistry three fundamental properties may be taken as indicating the nature of the element, *viz.*, physical properties, relative activity and relative basicity. The physical properties show some very interesting relations and the working out of these relations not only leads the student into a study of the uses of the elements but helps him to differentiate between physical and chemical properties and gives him a working acquaintance with the elements as such. A study of the relative activity of the elements leads to a knowledge of their occurrence and metallurgy and such properties as solution tension, stability in air, tendency to form binary compounds and the resistance of their oxides and halides to the action of reducing agents. Relative basicity, on the other hand, has to do with the strength of base or acid, the types of salts formed and their stability both in and out of solution. In this connection the student is led into a study of hydrolysis, amphoteric properties and the relative basicity of the different valences of variable valence elements.

In view of the fact that the Periodic Law is qualitative the student will find considerable apparently conflicting evidence. He will need, therefore, to analyse the data and explain why certain reactions take place or do not take place. To do this he must have a clear knowledge of the facts. An accurate, expressive and easily understood form of periodic table not only makes the task easier but also serves to develop the student's interest in the task. Although some form of cylindrical table expresses more nearly the actual relations existing between the different elements, it lacks simplicity and is less easy to picture than an arrangement in a plane. While the accompanying table makes no claim to any great amount of originality it has been used with gratifying results in illustrating the systematic nature of chemistry, in stimulating the interest of the student and in bringing to his attention the fact that even the dry statements concerning occurrence, preparation and properties are so correlated that he can use his powers of reason and not be dependent wholly on memory.

It will be noted that the arrangement is, in a general way, similar to that of the Mendeleeff table. The distinction between divisions A and B of each group, however, is clearly pointed out, as well as the relation between these and the introductory elements. While it shows that each

PERIODIC CLASSIFICATION OF THE ELEMENTS.



group is a unit in itself, it also indicates that some relation must exist between groups one to seven inclusive. Although the positions given to groups zero and eight do not bring out their transition character as would a cylindrical form, they clearly show their distinction from the remainder of the table, which after all is of more importance from the standpoint of a practical correlation of properties.

Instead of following the usual custom of arbitrarily placing the first two elements of a group as introductory to the subdivisions they are given positions corresponding to their properties. Lithium, less basic, less active and more nearly resembling in appearance the average metal, is clearly between the alkali metals and the inactive copper, silver and gold, but more nearly like the alkali metals. With sodium it is slightly differentiated from potassium, rubidium and cesium chiefly because of the difference in solubility of their tartrates, chloroplatinates and alums, and their inability to form double halides or complex ions.

In group II, beryllium is likewise the introductory element since in activity, basicity and physical appearance it is intermediate between divisions A and B. Contrary to the usual custom magnesium is placed between beryllium and calcium thus drawing the attention of the student to its actual properties rather than to its physical appearance. In the remaining groups the second element is placed in the introductory position since its properties more nearly lie between those of the two divisions, and in the last groups this element is given a position showing its increasing similarity to the B subdivision. Although this does not give a symmetrical appearance to the table it does point out the more rapid change to acid properties at the top of the table, as well as indicate the peculiar characteristics of the initial elements in these groups and arouses the student's interest to a study of atomic structure for an explanation.

In group III the rare earths (atomic numbers, 59–71 incl.) are shown as related to division A but not as an integral part of it. While in valence, types of compounds, etc., they closely resemble division A they do not follow the variation indicated by Scandium, Yttrium and Lanthanum either in basicity or in solubility, the two most important properties. As to their arrangement with respect to each other too little data is available to do more than place them in consecutive order according to their atomic numbers. Their basicity seems to decrease in this order, which is just the opposite from that of the other elements of that division.

By showing the distinction between the two divisions in each group, a logical reason is given for placing copper, silver and gold in group I and manganese in group VII, thus removing what has been one of the most glaring defects of Mendeleeff's table and one of the chief reasons for lack of interest on the part of the student. The table is compact; its meaning

is easily understood; it has no elements illogically placed and shows blank spaces only for the five undiscovered elements mentioned in Moseley's atomic numbers. While the main purpose in the preparation of the table has been to secure a simple, compact and readily understood picture of the relative chemical and physical properties of the elements to be used as a basis for the correlation of the facts of chemistry, it is believed that it also expresses a logical relation between the elements in the light of our present conception of atomic structure.

THE TEACHING OF AGRICULTURAL CHEMISTRY*

The teaching of Agricultural Chemistry presents problems which are peculiar to itself. Agriculture includes the application of the sciences of biology, physics and chemistry to plant and animal production and the laws of economics to the marketing of the final product. Agriculture deals with living organisms and an agricultural chemistry which does not devote its major emphasis to a consideration of the chemical processes which take place in living matter is not truly agricultural chemistry, nor is it capable of taking its proper place in an agricultural curriculum.

The statement has often been made that there is only one kind of chemistry—chemistry as taught to chemists—pure, unadulterated and undefiled! Your committee wishes to challenge this statement. At the outset, let it be understood that we are not in favor of creating courses of chemistry for agricultural students which are couched in "words-of-one-syllable," for an agricultural student is as capable a student as is his brother in so-called "pure science," but we do wish to emphasize the need of capitalizing the professional spirit of the agricultural student so that maximum interest may be maintained throughout the course.

To illustrate—In our schools of chemistry at the present time, the illustrations are largely, if not wholly, drawn from the fields of engineering and related arts. When phosphorus is mentioned, emphasis is nearly always placed as to its effect on the properties of steel; rarely or never is the student told that phosphorus is an essential component of every cell and in that cell is always found in the most vital part—the nucleus. The industrial uses of sulfur, its modifications of the properties of coal, coke, iron, etc., are usually noted, but the fact that it is an integral component of the mechanism which in all probability controls cell respiration, and

* Report of a committee of the Division of Chemical Education of the American Chemical Society. The committee, consisting of Dr. J. W. Read, Dr. H. R. Kraybill, and Dr. Ross Aiken Gortner, Chairman, was appointed by Dr. Edgar Fahs Smith following the New Haven Meeting of the Society. After some correspondence within the committee, the present report was prepared by the chairman and approved by the other members of the committee.

that animal life is dependent upon a sulfur containing amino acid is rarely, if ever, mentioned.

The chemists should have "chemistry for the chemists." The illustrations may be drawn from any field of nature for the chemists are interested in the mechanism of the interchange of chemical energy. The engineer should have "chemistry for the engineer" with the illustrations drawn from the field of engineering, for he is interested in the effect of chemicals on tensile strength of structural materials, on manufacturing problems, etc.; and the agricultural student should have chemistry where the illustrations are drawn from the great fields of agriculture and biology—the relation of chemistry to living processes.

The fundamental bases—the chemical laws—of all of these courses are identical, the illustrations used in the lectures and the materials tested in the laboratories are the variables. Where "general chemistry" is given to a mixed group of chemists, engineers and "ags," it is often said that the "ags" are inferior students, and are apparently not interested in the work. Your committee asks why they should be interested when they rarely or never hear an illustration used which shows the application of chemistry to their particular field, when they rarely or never conduct a reaction in the laboratory which they can see to be closely related to the problems of their chosen profession.

We believe that if "general chemistry" were taught with agricultural applications and agricultural materials, you would find the agricultural student to be the one who was alert and aggressive, and the engineering student to be unresponsive and dull. *The professional spirit must be capitalized* in the classroom, if our teaching is to return the maximum dividends. Any course of agricultural chemistry which emphasizes solely the *chemical* reactions which are involved and does not correlate these reactions with the more important problems of cell structure, growth, action, and interaction is a failure regardless of how well it may be taught or how fundamental its principles may be. The instructor has failed to make the most of his opportunities; he has failed to point out the fact that chemistry is an essential tool for the adequate understanding of biological processes and that plant and animal growth, maintenance, and reproduction depend upon the interaction of physical and chemical laws.

The students of our agricultural colleges may be divided into three major groups, each of which present their own problems from the standpoint of the chemistry which they need and the type of instruction which they should receive. These groups are:

1. Students of agriculture who will specialize in some branch other than chemistry.
2. Students of Home Economics.
3. Students who intend to specialize in agricultural chemistry.

The requirements of each group are the same in so far as "general chemistry" is concerned. They should all receive the equivalent of a five hour course of general chemistry continuing throughout the freshman year. This course should, in so far as the essential laws are concerned, be as "fundamental" as any elementary course. The illustrations, however, should be drawn, in so far as is possible, from the fields of biology and agriculture, including nutrition, cell organization, and the role of the different elements and chemical compounds in living processes. Following this freshman year, the ideal curriculum would provide for separate instruction for the different groups.

1. The agricultural group. This group should, during the sophomore and junior years, have certain required courses covering the essentials of organic chemistry, quantitative analysis, animal nutrition, and soils. These subjects may be given in separate courses or may in some instances be combined in two or more courses as the curriculum problems of the individual institution or the facilities of the department may demand. The organic chemistry should *not* be the organic chemistry for the chemist. The chemist can enthuse over the halogen derivatives of the hydrocarbons and over the rearrangements of a labile hydrogen atom. The agricultural student is interested in the organic chemistry of living matter, in the elaboration of proteins, carbohydrates, and fats in the vegetable kingdom and their utilization in the animal body, over the decomposition of the vegetable debris in the soil through the action of microörganisms and the utilization of such materials by the succeeding crop, in short—the organic chemistry for this group of students ought to be taught with minimum emphasis on theory and maximum emphasis on those organic compounds and reactions which are a vital part of living processes. Almost invariably courses in "pure" organic chemistry pass over proteins with, at the most, only a casual mention. This group of agricultural students should devote, if possible, several weeks to this subject and its ramifications.

Training in quantitative analysis is necessary because here the student learns exact methods of manipulation and precision of work. The materials should, however, be materials in which he is interested,—phosphorus in rock phosphate; nitrogen in feeding stuffs; lime in bone meal; magnesium in plant tissues, and its relation to the chlorophyll molecule; iron in plants and soils, and its relation to chlorosis; potassium in soils—if possible in soils from his own section of the state. The training in method of thought is the same, the superior efficiency of the method is beyond question. The courses in animal nutrition and soils should be taught from a chemical viewpoint, but with emphasis on biochemical application rather than upon theoretical considerations. Elective courses in pure chemistry or special fields should be open to students following the completion of all or part of the above courses, and many of the students,

particularly those specializing in the other agricultural sciences will elect such courses.

Students of Home Economics require a somewhat different treatment from students of general agriculture. Following the freshman course, there should be given the essentials of organic chemistry, quantitative analysis, and physiological chemistry with special emphasis on human nutrition and metabolism, with further courses for those who intend to become dietitians. The instruction covering this work may be distributed through two or more courses depending upon curriculum problems and laboratory facilities. The organic chemistry should lay especial emphasis upon those types of organic compounds which are present in foodstuffs or which are vital constituents of the cell. The course need not include the organic chemistry of the soil or the application of organic chemistry to agronomy and animal husbandry which would be included in the courses for the general agricultural student, but the organic changes produced by cooking, processing and the digestion of food should be emphasized. In short, here again the organic chemistry of the proteins, carbohydrates and fats should be especially emphasized, but with the appeal to the special interests of the home economics student. Training in quantitative analysis is essential in order to teach exact methods of thought and work. The preliminary experiments should be so organized as to definitely point toward a later utilization of the experience and technique in the analysis of textiles, foodstuffs, biological fluids and a study of food and textile technology. The professional spirit of the student should be capitalized throughout the courses and the value of the chemistry courses in the field of the student's major interest should be repeatedly pointed out and emphasized.

The third group of students—those planning to specialize in agricultural chemistry—present a still different problem. The agricultural chemist should be more than a chemist, he should have a rather broad knowledge of the fields of animal biology and botany, a rather detailed knowledge of cell structure and functions, a knowledge of physiology, an acquaintance with the theories of heredity and immunity, and above all, an absorbing interest in every phenomenon which is or may be involved in living processes. The botanist, the agronomist, the zoologist, the entomologist, the geneticist, and the pathologist are more and more coming to realize that they are engaged in studying extremely complicated chemical reactions and they are calling more and more upon the chemist for assistance. Unless the chemist can talk their language and meet them on common ground, his assistance will fall far short of the possibilities of the science.

Somewhere in the course of training, the student specializing in agricultural chemistry should get a "viewpoint." He should early come to see the relation between chemistry and living processes. If his curriculum

can be so arranged, it would be advantageous for him to take his first introduction to organic chemistry in the course for general agricultural students, this course to be paralleled or followed by a longer and more intensive course of "pure" or "theoretical" organic chemistry. Such a student, having once learned to look at biological processes as applications of chemical and physical laws, can now be given the fundamental training which every chemist should receive, including mathematics, physics, organic chemistry, quantitative analysis, physical chemistry, colloid chemistry, etc., but he should, likewise, receive special courses, such as cereal chemistry, dairy chemistry, colloids from the standpoint of biology, enzymes, carbohydrates, soils, etc., of longer or shorter duration, preferably taught by a specialist, who is actively engaged in research work in the special field or at least by some one who can be considered an authority in the field in question.

It is obvious from the above that the student specializing in agricultural chemistry must plan to spend several years in graduate study which should include not only chemistry courses, but advanced courses in the biological sciences for the chemist who knows but little biology is as unfit to attack biochemical problems as is the biologist who knows but little chemistry.

Your committee realizes that this is but a hasty outline of some of the phases of teaching agricultural chemistry. We wish to emphasize again the idea that a real gain in education can be secured by capitalizing the professional spirit of the student, and that the agricultural chemist must be able to explain his science in the terms of the biological sciences, otherwise he cannot make the greatest success in his profession.

Approved

ROSS AIKEN GORTNER, *Chairman*
University of Minnesota
J. W. READ
University of Arkansas
H. R. KRAYBILL
University of New Hampshire

PLAY BALL IN CHEMISTRY

FRED F. COPE, VIRGINIA JUNIOR COLLEGE, VIRGINIA, MINN.

Often chemistry courses involve too much work and not enough play to hold the interest of the average student, while by a slight modification of the methods used much of the work may be changed into play and the same results accomplished with a much less expenditure of energy. Such a plan has been tried out at this school with excellent success.

A certain Freshman chemistry section, all boys, and most of them good athletes, seemed to be lagging behind. In attempting to find some method by which they could be brought back to standard, the following plan suggested itself and was subsequently worked out in detail and tried.

The school year is divided into two semesters and each semester into three terms of six weeks each. A chemistry baseball league was organized. The students were the players; each section was a team. A three game series was played each semester, each term constituting a game of six innings, each week being counted as an inning. The score was kept by innings.

The students were graded in two ways. Their fielding average was the average of their laboratory grades made up weekly. Their batting average was the average of their daily recitation quizzes. Once each game every student was called upon to show his ability as a pinch hitter which was his grade in the final term examination. The students' fielding average, batting average and pinch hitting in the ratio of 2:2:1 respectively in a five credit hour per semester course, made up his playing score. The average of the playing scores made up the team score on which the team won or lost the game.

In addition the following points were worked out. Hits represent the number of grades made "at bat" above passing. Strike-outs are the grades "at bat" below passing. A grade of 100% made "at bat" was counted as a home run. A grade above passing made in the laboratory was counted as a put out and a grade below passing as an error.

Thus two sections were matched against each other and the game called. Score pads were made from white wrapping paper secured from the local store and with black crayon. The pads were placed above the blackboard and the score was kept by innings. Interest ran high.

An illustration of the score pad follows.

Players	Fielding Attempts						F.A.	At Bat								B.A.	P.H.	P.S.	H.	H.R.	S.O	E.	P.O.
	1	2	3	4	5	6		1	2	3	4	5	6	7	8								
J. Bankman	95	65	90	77	93	70	80	81	100	91	79	95	100	85	90	90	93	96	9	3	0	2	4
H. Warner	88	85	79	96	92	90	88	95	91	70	88	80	65	81	75	81	90	86	6	0	2	0	6
G. Johnson	68	75	92	79	86	70	77	86	85	85	70	65	89	58	80	75	82	79	5	0	3	2	4
K. Sothe	91	85	79	85	95	86	88	81	78	68	85	90	61	78	90	76	85	93	6	0	2	0	6
H. Mattson	78	62	80	65	85	70	73	100	104	88	77	93	100	86	90	92	97	88	8	3	0	3	3
Team Average	82	74	82	81	90	77	81	89	91	80	80	83	83	78	84	83	86	88					

P.H.—Pinch hitting; P.S.—Playing score; H.—Hits; H.R.—Home runs; S.O.—Strike outs; E.—Errors; P.O.—Put outs; B.A.—Batting average; F.A.—Fielding average.

Of course, difficulties were encountered. Some low-grade but hard-working conscientious students did not like to have their grades posted.

And again, grades are not absolute. There are certain cases where personal estimation must enter in. In this case it must enter in before the grades go on the score pad or the students will suspect the instructor of favoritism. Also the plan involves some additional work. Two students from each section were appointed to keep the score pad made up. The instructor must also keep the grades in his record book. All of these difficulties were overcome.

Many unexpected advantages were gained by the plan. For example, the low-grade student saw at once that he was not only holding himself back but that he was holding the whole class back. Students went into it with enthusiasm, and knocked home runs with that same feeling of pride and glory that an athlete feels who has accomplished similar results on the field. It taught the instructor that he must be very careful about the fairness of his quizzes. It tided over that monotonous period which sometimes follows soon after the beginning of the second semester.

The plan is adaptable to almost any size chemistry class. In the one section class, individuals can compete for the highest playing score. More interest can be aroused in the larger classes where sections can be matched, especially where Arts sections can compete with Engineering sections or girl sections with boy sections.

In a larger sense we are not training chemists only, for certainly the majority of our Freshman chemistry students do not become chemists. We are training players for the big game. The instructor is both coach and umpire. He has a big responsibility teaching these young players to play the larger game in a sportsmanlike manner.

THE COURSE IN HIGH SCHOOL CHEMISTRY*

ALFRED L. FERGUSON, CHEMICAL LABORATORY, UNIVERSITY OF MICHIGAN

When a course is to be introduced into the high school, or for that matter into any other educational institution, the first question to ask is, why should such a course be offered? What are its objectives? What is to constitute the subject matter?

In connection with the course in high school chemistry, this question has been rather extensively considered by local, state and national organizations. Advice has been freely and abundantly given to the high school teacher as to what should be taught. When he comes to look over this advice, however, he finds himself in a sort of maze. One supposedly good authority tells him he should teach such and such things and that he should endeavor to accomplish such and such objectives; the next, probably equally good authority directs him to teach something decidedly

* Read in the Division of Chemical Education of the American Chemical Society, at the Washington Meeting, April 24, 1924.

different, and to strive for objectives which may conflict with those recommended by the first. What usually happens under such conditions? Most high school chemistry teachers do not have sufficient background to analyze the situation, and what happens is all the advice is discarded and he proceeds to teach whatever is included in the particular text the school happens to be using.

We all know the reason for this condition of affairs, it is simply because we are passing through a transition period. Authorities are not agreed on this question, what should be the aims of a high school chemistry course? When you and I took our beginning chemistry this conflict of views did not exist. The aims of the chemistry course at that time are well expressed in a statement made by the Superintendent of Public Instruction of Michigan in 1905. According to him, "The purpose of chemistry in the high school is primarily discipline. The ability to do, to observe accurately, to make logical inferences and to draw correct scientific conclusions as a result of observations, and to express results in correct English, is worth more to the pupil than the mere accumulation of facts, however important the facts may be, and is the important aim of the subject." That is the sort of training which you and I received, at least those of us who were fortunate enough to have a teacher possessing the proper qualifications.

Now what is it the present day educators would have us substitute for these aims? The objectives of this new school are probably best expressed in the report of the National Committee on the "Reorganization of Science in Secondary Schools." This report is published in the form of a bulletin by the Department of Interior, Bureau of Education, Washington, D. C., 1920. Many of you are probably already familiar with this bulletin, I hope that those who are not will give it some careful study; not that I advise you to put into practice the recommendations therein, but rather that you may be aware of the changes that are being advised and if you are not in favor of all of them you will be in a better position to combat those you do not approve.

I wish we had time to take up and discuss in detail each of the reasons, which are offered here, why the high school chemistry course should be reorganized, and the new aims which they advise. I shall consider just two or three. The first is this, "The average person looks upon chemistry as a mysterious, occult science, tinged with necromancy. This almost superstitious ignorance prevents appreciation of the chemist's power to serve society. In industry it is likely to result in great economic waste through failure properly to utilize raw materials, develop by-products, and apply chemical methods of control to processes of manufacture. The high school chemistry course in its reorganized form should attract a larger number of pupils and do much to supplant this ignorance by a measure of broad un-

derstanding." This is a high purpose alright, but the question is, will it be accomplished any better by the reorganized course? So far as eliminating any feeling of mystery and superstition is concerned I believe the course as it used to be given accomplishes that. And when it comes to offering a high school course which will have much influence in changing manufacturing methods it cannot be done. Let me ask you, how many high school chemistry teachers are there in the country who are familiar themselves with the economic wastes in our industries and with the possible by-products that are being run into the sewers and the chemical methods of control which might be used but are not. I doubt if a young man possessing this information would be teaching high school chemistry. But the high school chemistry teachers are really not to blame for not being familiar with industrial operations, they have not been given an opportunity to learn about them. How many colleges and universities are offering courses along this line which might be taken by a person preparing to teach? I know we do not at Michigan and I have failed to find many such courses listed in the catalogues of other institutions. But now suppose we did have a teacher familiar with all these things, I doubt very much whether he would be able to turn out, in a single high school course, approximately eighteen-year-old children who would do much toward overcoming these industrial defects. As an objective for a four years' course in a University it might be reasonable.

Now let us look at the second reason. "In the past, chemical laws, theories and generalizations have usually been taught as such, and their applications in industry and daily life have been presented largely as illustrative material." This is what they would have us do. "In the reorganized course this order should be reversed. Laws and theories should be approached through experimental data obtained in the laboratory and through applications with which the pupil is already familiar and in which he has a real interest." That is, they want the high school teacher to send his pupils into the laboratory to get experimental data, and then on the basis of this data, derive the laws and theories of chemistry. How many of you think it would work? Theoretically the method is probably correct. The science of chemistry has developed historically largely in this way, but any person who gives the question serious thought, who realizes the immaturity of the high school student, and the nature of the equipment in high school laboratories must certainly appreciate how utterly absurd it would be to attempt to formulate laws and theories from data obtained by the students in the laboratory. We do not even attempt to do this in our colleges and universities. I can appreciate how a theoretical educator from the education department, who probably never saw the inside of a chemistry book, might make such recommendations, but I cannot conceive of a teacher of chemistry doing so.

I wish to take time to consider just one more of their reasons. They state, "In the past, chemistry courses over-emphasize theories, concepts, and information of value principally to those who will pursue advanced courses. A course which emphasizes the chemistry of industry, of commerce, of the soil, and of the household furnishes a wider outlook, develops a practical appreciation of the scope of chemical service and moreover arouses an interest which leads naturally to further study." This is their big argument and with many, carries much weight especially when it is stated that only an extremely small percentage of high school students ever go to a higher institution of learning. It is an argument which is readily accepted by school superintendents and other administrative officials because they realize in it something tangible, something which will be appreciated by their school boards and the people in general. But before swallowing it, bait, hook and sinker it is well to stop awhile and think it over. The question involved here is a broad one and is not limited simply to the subject of chemistry but concerns the whole system of secondary education, or for that matter both primary and secondary education. Should our educational system be of such a nature that the pupils are exposed to as much information and as many facts as possible which have an apparently evident, direct, tangible, bread and butter producing value, and immediate bearing upon their daily life. The idea being that by so doing the pupils will absorb or soak up like a sponge, with the least effort on their part, the greatest amount of material. As I see the changes which have been taking place in our educational system for sometime it looks to me as though this is its ultimate aim. The tendency all the way through seems to be to make all work appear like play and as a result we are developing a play crazy generation. All of the bitter doses in our older system are now either being left out entirely, as for instance Latin and physics, or they are being fed in capsules or sugar-coated tablets and the pupils fooled into thinking they are eating candy. The tendency seems to be to cram the pupils' heads full of information and facts. The method of acquiring this information is considered of no consequence except that it should be made as easy as possible.

At the present time we hear the cry going up on all sides that the younger generation is not up to standard, that they are lacking in moral character, stability, sound judgment, reliability, respect for authority, etc. It is my opinion that this change in our educational system to which I have just called attention is largely responsible. There is too great a tendency in school and also at home to smooth out all the rough spots in the paths of our children, to make everything appear like play, to eliminate all the bitter things and hardships from their lives. What is there about this new system to develop determination, perseverance, sticktuitiveness, stability and the other qualities that make real men and women with

characters such as were possessed by our pioneer ancestors. Up until a few years ago pupils thought nothing of walking several miles to school and then they had their chores and their lessons to do after they got home. Now they have a motor bus to pick them up and bring them back, or they drive their own automobiles. They used to spend many evenings attending spelling bees and debating clubs, now they spend them at dances or the movies.

I am not in sympathy with this tendency to make chemistry easy and attractive by sliding quickly over the laws, theories and fundamental principles and including a lot of interesting information about the everyday and industrial applications. I will agree that possibly not enough emphasis is given to the practical and human side of chemistry. I should be glad to see some of the later descriptive work on the metals and some other topics shortened to make more time for the commercial treatment. My contention is that you cannot teach the chemistry of daily life, agriculture, household, industry, and commerce without first establishing a medium of communication, that is, a common language. Suppose the high school French teacher attempted to instruct the class about the literature, customs, ambitions, etc., of the French people by talking to the class in French about these things before the class could understand the language; you would call this absurd, but it is no more absurd than to talk to the class about the applications of chemistry before they are thoroughly familiar with the language of chemistry.

Chemistry is one of the best subjects in the high school to develop those habits and qualities of character which we admire in certain people with whom we come in contact, and which are almost invariably present in the really successful men and women. And the training along these lines which the pupils get in their chemistry or any other course is of far more value to them than the facts and information. In a few years facts and information are for the most part forgotten; but the ability to correlate facts, to make accurate observations, to think for themselves, to draw logical conclusions, to stick to a thing and see it to the end, these qualities and habits which a course in real chemistry given by a real teacher will develop, will stick by a person throughout life and will be of far more value to him than a head full of facts and information when it comes to tackling the real problems of life. And it does not matter whether the individual continues his work in college or goes onto a farm or behind a counter or into the industries. The man who cannot think for himself is destined from the very start to be a slave to the man who can.

There is another point which I wish to bring up. I have been wondering for sometime if possibly we have not been wasting a lot of effort barking up the wrong tree, so to speak. Various organizations including this one, have been giving much attention to what should be taught in high school

chemistry. After all, is the really vital question one of content of course? May it not be rather one of qualifications of the teacher? If the teacher has had a thorough preparation in chemistry and is a competent teacher will he not handle the content of the course in a satisfactory manner without further advice or instruction from us?

I believe that this organization could be of more real assistance to the cause of chemistry by taking steps to standardize and to raise the qualifications of high school chemistry teachers throughout the country, than by any other means. I am confident that much may be accomplished along this line and the Education Division of the American Chemical Society is the best organization for undertaking this task.

NOTE: I shall be much pleased to receive personal communications from those who read this. I shall be as interested to hear from those who disagree as well as from those who agree. I am anxious to learn the opinions of chemists and chemistry teachers on this important subject.

ABSTRACTS FROM THE ITHACA MEETING OF THE A. C. S. DIVISION OF CHEMICAL EDUCATION

NEIL E. GORDON, *Chairman*

WILHELM SEGERBLOM, *Secretary*

What Is the Best Type of a Course in Qualitative Organic Analysis? S. P. MULLIKEN. The answer to the question raised in the title of this paper is dependent on the type of student for whom the course is to be given. Brief combination courses in which this subject is taught as an integral part of laboratory course in Organic Chemistry have great educational value, but are not enough for the training of men who are to specialize in Organic Chemistry. Suggestions as to the content and extent of the course best adapted for adoption under various conditions were made.

The Teaching of Biochemistry. C. H. BAILEY. Since biochemistry is a subdivision of the chemical sciences, the teaching of which is superimposed upon the courses in the general branches, it is necessary for the biochemical departments to coöperate with instructors in the prerequisite courses to the end that the latter may be presented with the use of illustrative material drawn from the biochemical field. It may also be possible to abbreviate the courses in organic and physical chemistry which are developed primarily for the biochemists. The course in biochemistry should include an early consideration of the colloidal state of matter, since many of the substances of interest to the biochemist occur in this state. Since the knowledge of enzyme phenomena is being increased, it becomes necessary for the instructors in biochemical courses to follow closely the new developments

and incorporate the facts that are coming to light in their treatment of this subject.

Correlation of Laboratory, Recitation and Lecture Work in General Chemistry. C. A. BRAUTLECHT. Results are taken from tabulated records of large classes and analyzed in respect to laboratory, recitation and lecture test grades, the variation in grades between different instructors and the average, the value of figure marks, and translation to letter grades. A scheme has been developed which meets the test of a staff inspection and upon which the department relies as fair to all concerned, the teacher, the student and the institution.

The Status of Chemical Education in England. DR. F. G. DONNAN. Chemical education in England is uncorrelated and disorganized. This is due to the way in which the English colleges were developed. There is no science entrance requirement for the English universities. There is little contact between the chemistry teachers in the colleges and in the fitting schools. Furthermore there is but little summer school machinery to bring them together. As regards the preparation of the students there is more hurry in England now than forty years ago. This is due partly to high fees caused by taxes and partly to the fact that sons of the middle class families must specialize early. These boys work on mathematics, physics and chemistry from the start, get their B.S. in three years and their M.S. in one year more. There are no examinations for the Ph.D. degree. To get a cultural education takes more time than can at present be devoted in most of the English universities. European competition is making the problem in England still harder. Like the United States England is trying to do too much and is hurrying too much. There has been a tendency to push science work back into the schools. Most schools give two years of science. At present there is a slight swing back towards literary work.

Status of Chemical Education in Scotland. DR. J. C. IRVINE. The history of Scottish education was traced from its early foundation on the church with teachers of specialized class to its present organization under an educational board with schools based on taxes. The equipment and the curriculum are now more modern and the student passes directly from the schools to the university. It was pointed out that the first laboratory instruction was established in Scotland and some of the great chemists such as Black, Ramsay and Dewar were mentioned. Arts students were compared with students specializing early. The arts students in many cases make the best chemists though the others may do better at first. The Carnegie Trust has been introduced into Scotland; the Government has also established research fellowships; students of limited means therefore now find it easier to complete their chemical education.

Important Points in the Construction of a New Laboratory. F. F. CLARK.

The Calculation of the Formula of a Compound from its Percentage Composition. JAMES KENDALL. A description of a device for interesting beginners in the method for deriving the empirical formula of a compound from its percentage composition.

Instruction in Colloid Chemistry. HARRY N. HOLMES. The subject of colloid chemistry deserves more teaching emphasis than a few lectures afford. Several universities and colleges are now offering formal courses in the subject, even with definite laboratory instruction. To do effective research on a colloid subject a man should have a general background in colloid chemistry, so it is important that a general plan of instruction be suggested. This the Colloid Committee hopes to offer at a future meeting.

An Improved Formula for Gas Laws. P. C. H. HYDE.

Motion Pictures as an Aid in Teaching Chemistry. FELIX A. ELLIOT. A survey of the application of motion pictures to the educational field was described. Motion pictures have been developed from ordinary pictures, lantern slides, etc. Many of the modern films available for educational purposes are industrial and a few of them teach chemical principles. A process was described whereby an instructor can now make his own films. The process does not seem unduly difficult. Such a film was thrown on the screen. It showed the various steps in the quantitative determination of silver and brought out well the technique required for this determination. A diagram was shown illustrating the relative positions of the lamps, object, operator and machine used in making the film.

An Adjustable Atomic Model. G. O. HIGLEY. This consists of a sheet metal box 8″ x 4″ x 3″ at the center of two concentric cubes made of steel rods. Inside of the box is a ribbon wound upon two cylinders in such a manner that by turning a milled head the atomic numbers and symbols may be caused to pass in succession back of openings in the front of the box. The central nucleus and the two electrons in the first shell are represented as fixed on the front of the box. The other electrons are represented by balls placed upon the corners of the cubes.

Status of Chemical Education in Germany and France. W. A. NOYES. Severe competition has put the best men in the college professorships in Germany and in France. College professors are selected more because of their ability as researchers rather than as teachers. The relationships between the students and the professors socially and educationally were described. The student attends the university to dig out what he is to learn while the professor is present primarily to help and not to present the subject matter. Students must pass hard examinations. Numerous anecdotes about living conditions in the universities were related.

Status of Chemical Education in the United States. NEIL E. GORDON. Activities under way during the past three years looking towards a better organization and correlation of chemistry teachers and their work was

described. Plans for the continuation of this work were given. For a brief outline see Progress of Committee on Chemical Education of the A. C. S.-II, on page 158 of the September issue of THIS JOURNAL.

MINUTES OF THE ITHACA MEETING OF THE DIVISION OF CHEMICAL EDUCATION OF THE AMERICAN CHEMICAL SOCIETY

The Division of Chemical Education began its work on Monday morning, September 8 with a meeting of the Committee on Chemical Education at which the report of progress of the Committee was discussed and plans for the activities during the next six months were outlined.

The Division had been granted permission to hold a General Meeting Wednesday morning. This was devoted to (1) a paper by Dr. S. P. Mulliken on the best type of a course in Qualitative Organic Analysis, (2) a discussion of the Report of the Committee on the Teaching of Agricultural Chemistry made at the Washington Meeting, the discussion being started by a paper on the teaching of biochemistry by Dr. C. H. Bailey and Dr. R. H. Dutcher, and (3) a paper by Dr. F. G. Donnan of the University of London on the status of chemical education in England.

The papers of Thursday dealt with Chemical Arithmetic, Adjustable Atomic Models, Motion Pictures as an aid in teaching chemistry and instruction in Colloidal Chemistry. The outstanding papers continued the discussion of the status of chemical education in various countries begun by Dr. Donnan the previous day. Dr. J. C. Irvine of the University of St. Andrews, Scotland, spoke of the condition in Scotland, Dr. W. A. Noyes of the situation in Germany and in France and Dr. N. E. Gordon gave a similar treatment for the United States.

Abstracts of all papers read before the Division are printed in THIS JOURNAL. As soon as space permits, most of the papers will be printed in full. The discussion on the papers was lively, illuminating and to the point.

Several standing committees made reports. Dr. E. Glenn reported for the Committee on Research in Chemical Education. He discussed the A. C. S. High School Outline briefly and then enumerated 20 different things which we do not know about High School Chemistry and indicated how data on these topics should be collected, published and acted upon, bringing out the unique position of the Division of Chemical Education with regard to handling the problems outlined. Dr. W. H. Chapin of the Committee on Research Problems in the pure science where the teachers have limited opportunities as to time and equipment, referred to his former paper and reported progress. Dr. A. P. Sy of the Committee on Nomenclature reported that the scope of his committee's work was widening so that it seemed advisable to ask that the committee be increased from 3 to 5 members. He asked that suggestions be sent without hesitation on any topics connected with his subject. These may be sent to Dr. A. P. Sy, University of Buffalo, Buffalo, New York. Dr. Glenn in speaking of the importance of the work of this committee criticised the technical vocabulary of high school chemistry stating that some high school texts use about 2500 new words. Dr. Pressy and Dr. Powers are collecting lists of terms.

At the close of the Thursday forenoon session Dr. Chas. E. Coates of Louisiana conducted an impromptu symposium on Chemistry Teaching Problems. Many remained for this, which turned out to be a very interesting and helpful hour.

At the business meeting Thursday afternoon much business was transacted. The

Committee on Permanent Organization appointed at an earlier session and consisting of E. M. Billings, Chairman, R. A. Baker, W. Schmidt, T. G. Thompson, R. E. Rose, J. Cornog and W. Morse with the President and the Secretary of the Division as *Ex-Officio* Members, reported on the By-Laws of the Division, the drafting of which had, according to the vote at the Washington Meeting, been left to the President and Secretary to draw up. The revised By-Laws were read by the Secretary and it was voted that the By-Laws be adopted.

BY-LAWS OF THE DIVISION OF CHEMICAL EDUCATION OF THE AMERICAN CHEMICAL SOCIETY

ARTICLE 1.—NAME AND OBJECT

Section 1.—This Division shall be known as the Division of Chemical Education of the American Chemical Society.

Section 2.—The object of this organization shall be to offer a common meeting ground for those interested in different branches of Chemical Education, and to coöperate with other divisions and organizations, particularly with state or regional associations of chemistry teachers.

ARTICLE 2.—MEMBERSHIP

Section 1.—There shall be two classes of members: active and associate.

Section 2.—Active membership shall be open only to members of the American Chemical Society.

Section 3.—Associate membership shall be open to any person who is interested in the object of the Division and who is not a member of the American Chemical Society.

Section 4.—Associate members shall be entitled to attend the meetings of the Division and take part in the discussion of the papers, but shall not have the power of voting for officers or of holding office, nor of giving papers before the Division. They shall have the right to vote for the contributing editors of the JOURNAL OF CHEMICAL EDUCATION through their respective state or regional associations, provided they are a subscriber to the said Journal. Associate members shall not be entitled to any of the other privileges of the American Chemical Society. Associate members may become Active members upon joining the American Chemical Society.

Section 5.—Dues for active membership in the Division, $1.00. Dues for associate membership in the Division, $2.00. One year subscription to the JOURNAL OF CHEMICAL EDUCATION, $2.00. Active membership and subscription, $2.50. Association membership and subscription, $3.00.

Section 6.—Any person may become a member of the Division by filling out, signing and sending to the Secretary of the Division a request essentially the same as that given below and shall remain a member as long as he fulfills the obligations imposed by the Division upon the members. An affirmative answer from the Secretary shall confirm the membership.

Form of application for membership:

I (give name and address in full) hereby request the Secretary of the Division of Chemical Education of the A. C. S. to enter my name as a member (mention whether active or associate is desired) of the Division and I hereby agree to observe the rules and by-laws of the Division so long as I am a member.

ARTICLE 3.—PUBLICATIONS

Section 1.—The official organs of the Division shall be the Journal of the American Chemical Society, Industrial and Engineering Chemistry, and the JOURNAL OF CHEMICAL EDUCATION. Authors who intend to publish the papers which are read before the Division must submit their contributions to the editor of one of the Society's Journals or to the editor of the JOURNAL OF CHEMICAL EDUCATION, before they can be published elsewhere; and if published in any other periodicals, the statement, that the paper was read before the Division at a specified meeting of the American Chemical Society, must be made.

ARTICLE 4.—OFFICERS

Section 1.—The officers of the Division shall be a Chairman, Vice-Chairman, a Secretary, a Treasurer-Business Manager, an Executive Committee, an editor-in-chief, and as many departmental and contributing editors as the executive committee may deem advisable.

Section 2.—The Executive Committee shall consist of the Chairman, Vice-Chairman, Secretary, Treasurer-Business Manager, editor-in-chief, and three other active members of the Division.

Section 3.—At the first session of the Division during the annual meeting of the American Chemical Society and following the report of the Secretary and Treasurer-Business Manager, the Chairman shall appoint from the members present at the meeting, a committee of three to nominate officers, except the editors, for the ensuing year. This committee shall present its list of nominations immediately before the election of officers at the last session of the Division during that annual meeting.

Section 4.—All officers, except the editors, shall be elected by ballot of the Active members present

at the last session of the Division during the annual meeting of the American Chemical Society, and shall take office at the close of the meeting at which they were elected. They shall hold office for one year or until their successors are elected, except the Secretary and Treasurer-Business Manager, who hold office for three years if reëlected.

Section 5.—The contributing editors shall be nominated by their respective local sections of the A. C. S. or by their respective State or Regional Associations of Chemistry Teachers provided such an association has been approved by the committee of Chemical Education of the A. C. S. When the nominations of the contributing editors are approved by the committee of Chemical Education they shall be considered duly elected. Where a State or Regional Association does not exist or has not been approved, the committee of Chemical Education shall have power to appoint a contributing editor for the said section. They shall be elected for three years, and such adjustments made at the beginning that the terms of one-third of the number expires each year. Anyone who is a subscriber to the Journal of Chemical Education may vote for the contributing editor.

The editor-in-chief shall be nominated by the contributing editors. The secretary of the division shall take this vote by letter ballot. The term shall be for one year unless reëlected, when the said term of office shall be for three years.

The number of departmental editors shall be left to the discretion of the executive committee. They shall be nominated by the editor-in-chief, and their term of office shall expire with the term of the editor-in-chief.

When the nominations of the editor-in-chief and departmental editors have been approved by the Council of the American Chemical Society, they shall be considered duly elected.

The compensation of officers and editors shall be left to the discretion of the Executive Committee.

Section 6.—Vacancies of office, including the editors which may occur between meetings shall be filled by the Executive Committee.

Section 7.—It shall be the duty of the Chairman to represent the Division in the Council of the American Chemical Society (except in such functions as are delegated to the committee of Chemical Education), to preside at the meetings of the Division and of its Executive Committee and to execute the decisions and recommendations of this Committee.

Section 8.—In the absence of the Chairman, his duties shall be performed by the Vice-Chairman.

Section 9.—It shall be the duty of the Secretary to arrange the program for the meetings to record and preserve the minutes and proceedings of the Division and of the Executive Committee, to keep a list of the Active and Associate members, to send members such notices as may be required, to transmit to the Secretary of the American Chemical Society the names of all officers and committees of the Division within three weeks of their appointment and to notify the Secretary of the American Chemical Society of any changes in officers and committees during the year.

Section 10.—It shall be the duty of the Treasurer-Business Manager to handle all subscriptions and advertising connected with the JOURNAL OF CHEMICAL EDUCATION and have charge of the funds of the Division and shall make such disbursements therefrom as may be authorized by the Executive Committee.

Section 11.—The Executive Committee shall manage the business affairs of the Division and any other work delegated by the Division. The Executive Committee shall authorize the disbursements of funds to be made by the Treasurer-Business Manager.

ARTICLE 5.—MEETINGS

Section 1.—There shall be a meeting of the Division at each general meeting of the A. C. S. The reading of papers and discussions shall constitute the major part of the program. The business meeting shall come preferably at the final session of the Division and the order of business shall be as follows:

Reading of Minutes.
Report of Executive Committee.
Report of Secretary.
Appointment of Nominating Committee (first session of annual meeting).
Report of special committees and discussion.
Report of the Committee of Chemical Education.
Miscellaneous business.
Report of Nominating Committee (last session of annual Meeting).
Election of officers (last session of annual meeting).

Section 2.—Members of the Division who may desire to meet at other times than those of the two general meetings of the American Chemical Society have the privilege of participating in the monthly meetings of any of the local sections of the American Chemical Society by paying the required local dues.

ARTICLE 6.—SPECIAL COMMITTEES

Section 1.—The Chairman, with the advice and approval of the Executive Committee, shall appoint such standing or special committees as may be necessary to consider, transact and report upon

special matters of business, provided, however, that such appointment shall not hold over after the term of the chairman has expired.

Section 2.—The Committee of Chemical Education of the A. C. S. shall act in an advisory capacity to all committees of the Division and shall transact any business which requires the action of the Council.

ARTICLE 7.—AMENDMENTS

Section 1.—Amendments to this Constitution shall be made only at the annual meeting of the Division by a two-thirds majority of the Active Members present, provided that a two months notice has been sent to the Active Members of the Division.

Section 2.—The amendments of the Constitution to be effective must be approved by the Council of the American Chemical Society.

It was voted that the Secretary draft a letter to Mr. Francis P. Garvan expressing the appreciation of the Division for the work already done by the Prize Essay Committee and confidence in the progress of the work under way for next year. This vote followed an announcement of the increased generosity of Mr. Garvan in establishing additional prizes.

Dr. J. C. Irvine, the University of St. Andrews, Scotland, and Dr. P. G. Donnan of the University of London, England, were elected honorary members of the Division.

The Treasurer's report showed the financial condition of the Division to be good.

Receipts from Subscriptions, Advertising and other sources...	$3788.47
Expenses of Secretary's Office and of publishing J. C. E.....	1748.22
Balance on hand.....	2040.25
Balance as per check stubs.....	2040.25

These accounts were audited Sept. 11, 1924 and found correct by W. Segerblom and A. P. Sy.

Estimated Receipts and Expenses for Sept.–Dec., 1924, are as follows:

Estimated Income from ads and other outside sources.....	$1900.00
Balance on hand in the bank.....	2040.25
Total estimated amount available.....	3940.25
Estimated Expenses for Sept.–Dec., 1924.....	3700.00
Estimated Balance on Hand January 1, 1925.....	240.25

This being the annual meeting of the Society, officers were elected for the coming year. The Committee on Nominations appointed at the Thursday morning session and consisting of Dr. L. C. Newell, L. W. Mattern and H. A. Carpenter made its report. The following officers were elected: Chairman, Dr. W. A. Noyes, University of Illinois; Vice Chairman, Dr. T. G. Thompson of the University of Washington; Secretary, Dr. B. S. Hopkins, University of Illinois; Treasurer-Business Manager, E. M. Billings, Rochester, New York; Executive Committee: Dr. J. D. Hildebrand of California, H. A. Carpenter of New York, and H. R. Smith of Chicago.

On Thursday evening a very enjoyable dinner of the Editors of the Journal of Chemical Education was held at the Ithaca Hotel. The present condition of THIS JOURNAL was discussed at length and was found to be highly satisfactory. The Editor-in-Chief reported over 1300 subscribers, many of them in foreign countries and many new subscriptions are expected as the result of the wide distribution of the September issue. Comprehensive plans were made for improving the Journal and for widening its sphere of activity among the chemistry teachers.

WILHELM SEGERBLOM, *Secretary*

Local Activities and Opportunities

Kansas' Association of Chemistry and Physics Teachers. This association is held in two sections, both on the same dates, October 16, 17 and 18. The Northeast Section is to be held at Topeka and the Southwest Section at Hutchinson. The programs are somewhat different.

Program of the Northeast Section.

1. The Suggested High School Course of the American Chemical Society.
   (*a*) From the standpoint of the High School—Harry James, Emporia High School.
   (*b*) From the standpoint of the College—Robert Taft, University of Kansas.
2. The Suggested First-year Course in Chemistry of the Committee of the American Chemical Society—A. T. Bawden, Ottawa University.
3. The relation of the General Science Course to later Courses in Chemistry and Physics—Ray McClellen, Liberty Memorial H. S., Lawrence.
4. What Preparation Should be Required of the Teachers of High School Chemistry and Physics?

Program of Southwest Section.

1. The High School Chemistry Course as suggested by the American Chemical Society—John M. Michener, Chemistry Department, Wichita High School.
2. Use of the Electron Theory in the Teaching of Physics and Chemistry. Written by Prof. Lawrence Oncley and to be read by Prof. Merle Suter, both of the Chemistry and Physics Dept., Southwestern College.
3. Observation on Science Teaching. J. E. Edgerton, High School Supervisor.
4. Getting Results in General Science. Miss Ruth Rhoades, Science Dept., El Dorado High School.

Tulane University. The chemical instruction in the Schools of Pharmacy and Dentistry, Tulane University, has recently been reorganized under the direction of Prof. H. W. Moseley, Chairman of the Department of Chemistry. Mr. Ralph W. Bost, M.A., University of North Carolina, has been appointed instructor in chemistry in these schools.

Mr. Parry Borgstrom, Ph.D., California, has been added to the staff of the department of chemistry, as Assistant Professor of Industrial Chemistry. Dr. Borgstrom was formerly associated with the department of bio-chemistry, Tulane, and with the research laboratory of applied chemistry, Mass. Inst. of Technology.

Louisiana State University. In connection with the building of the plant of the new State University at Baton Rouge, a handsome new chemical laboratory is being built under the direction of Dr. Chas. E. Coates, professor of chemistry. It will be finished and ready for occupancy with the opening of the University, in the Fall of 1925. The equipment and facilities of the laboratory are being modeled after the more recently constructed laboratories of Yale and Cornell, and when finished will be one of the finest laboratories of chemistry in the South.

University of Buffalo. D. Kumro, B.S., and M. Woodburn, B.S., instructors in chemistry at the University of Buffalo last year are doing graduate work this year. The former is at the University of Illinois and the latter at Northwestern University. L. M. Lawton, B.S. (Syracuse) and E. S. Pelowski, B.S., are the new instructors substituting for these men.

Prof. E. R. Riegel, Chairman of the program committee of the Western New York Section of the A. C. S. has completed arrangements for meetings at Buffalo and Niagara Falls during the coming season. There is promise of interesting meetings since the speakers' list includes Dr. G. H. A. Clowes, of Indianapolis, Prof. H. N. Holmes of Oberlin, Gen. Amos Fries of the CWS, Prof. H. H. Willard of Univ. of Michigan, Dr. E. Emmet Reid of Johns Hopkins, and Dr. Baekland, President of the Society.

Organization of Chemistry Teachers. Prof. A. P. Sy, of Buffalo, N. Y., reports that plans are being made to organize the chemistry teachers of Western New York, probably in connection with the Local Section of the A. C. S.

Oberlin College. The Palmolive Soap Fellowship ($2000) has been awarded for the second year to Mr. Paul H. Fall, an Oberlin graduate. The research work is being done with Dr. W. D. Bancroft at Cornell University.

West Virginia University. The West Virginia University has opened with 782 chemistry students. There are 48 chemistry majors in the College of Arts and Sciences.

The new chemistry building at West Virginia University is progressing satisfactorily. The second floor is ready for the cement. The contractors expect to have the building under roof on or before mid-winter.

R. B. Dustman, Ph.D., Chicago, A. R. Collett, Ph.D., Yale, and C. E. Garland, Ph.D., Johns Hopkins, have joined the chemistry staff of West Virginia University.

Fellowship at the University of Missouri. This fellowship will pay one thousand dollars a

year. It is expected that the appointee will complete the work for the doctorate in connection with this investigation. The man must have a good training in chemistry, a fair training in physics, one or more courses in physical chemistry, preferably some colloid chemistry, a bent for investigation, some agricultural training or agricultural experience, a Master's Degree or who has practically completed the work necessary to secure one, and some knowledge of foreign languages. For further information write to Dr. Richard Bradfield, University of Missouri, College of Agriculture, Department of Soils, Columbia, Mo.

Recent Books

A Diagnostic Study of the Subject Matter of High School Chemistry. By S. R. POWERS, Ph.D. Teachers College Contribution to Education, No. 149. Published by Teachers College, Columbia University. 1924. viii. 84 pages.

This monograph is a report of a study made at University of Minnesota. It comprises 9 chapters, 25 tables and an appendix. To ascertain the relative difficulty of topics taught in elementary chemistry, the ability in different schools, and the degree of retention of subject matter, 8 tests were run in 1920–22 in 15 Minnesota high schools and 28 high schools outside Minnesota. In all 350 items were used, from 20 to 102 per test. These were selected from the most widely used texts and covered valence, elements mixtures and compounds, chemical composition, definitions, activity series, biography, chemical changes (laboratory and commercial), uses of substances, solubility, numerical ratios and calculations, names for formulas, formulas for names, completing equations and writing entire equations.

The percentages of correct answers to each item are given in full, are tabulated in different ways and then are discussed at length from the point of view of the difficulty of the items. They are given as follows: (1) the achievement in different schools, (2) do the items of the tests fairly represent the subject matter of the textbooks? (3) how long do students retain the facts which they have learned about chemistry? and (4) achievement of university students. Succeeding chapters deal with summaries, recommendations and construction and study of the scales.

To try to abstract here the conclusions derived from the tables would not do justice to the wealth of information found in these pages. The showing made by the students in many cases is rather discouraging. "A large proportion of the textbook material means little or nothing to 50% or more of the students who have studied one of these texts in high school for one year." The investigation reveals, however, that radical changes in content of high school chemistry and methods of instruction are much needed and indicated where some of these changes might be made. Constructive teachers would do well to familiarize themselves with results of Dr. Powers' work. The monograph must be read closely to get all the points.

Adverse criticisms are: Certain items tend to confuse the reader and make him lose the point, *e. g.*, wide variation in the number of students taking tests, and in the number of questions in different sections of the tests, failure to bring out clearly the difference between the terms per cent correct, per cent scores, grade scores, scale scores, ranks, rank orders, medians, median scores, ability levels, quartiles, etc. In a few instances abbreviations are used without showing what they signify. Misprints were found on pages 4, 18, 19, 27, 46 and 55, but the context makes the meaning clear. The phrase "the precipitation of calcium bicarbonate with slaked lime" on pages 23, 24 and 43 is ambiguous. Some of the above criticisms disappear, however, if the monograph is intended for a limited and specialized reading public rather than for general reading by teachers.

The reviewer regrets that so many of the items Dr. Powers has selected deal with nomenclature, facts, and to some extent with principles. Many of these are easily forgotten. One wonders how the students would have fared on items testing their ability to reason or to think chemically. Many high school teachers trust that they are getting across some of the reasoning ability rather than straight memory work. This does not condemn the monograph under review but simply suggests another angle of approach. This monograph should be in the hands of every chemistry teacher and it should prove of much help in the correlation work now being done by the Division of Chemical Education of the American Chemical Society.

WILHELM SEGERBLOM